Claims

1. A method for manufacturing an organic electroluminescent display device, wherein an arrangement of layers is applied to a substrate such, that in a first direction, first conductors extend as well as second conductors in a second direction, while between crossings of the first and second conductors an organic electroluminescent compound has been provided which, under the influence of a voltage, emits light, the substrate being manufactured from plastic and having a surface structure which forms a boundary for at least a number of the layers which are applied, a first conductive layer being applied by means of a layer application process, the surface structure of plastic substrate being provided with a shadowing structure which is such that with the layer application process, parts of this shadowing structure are hardly covered, if at all, with the respective conductive layer, the shadowing structure being such that the electrical resistance prevailing there is great relative to the resistance in the rest of the conductive layer.

2. A method according to claim 1, wherein the manufacture of the substrate takes place with the aid of an injection molding process.

3. A method according to claim 2, wherein in the injection molding process use is made of an injection molding mold which is provided with a negative image of the desired surface structure of the substrate.

4. A method according to claim 1, wherein the manufacture of the substrate takes place with the aid of embossing, photopolymeric replication or a similar plastic formation process.

5. A method according to any one of the preceding claims, wherein after the manufacture of the plastic substrate, a first transparent encapsulation layer is applied to the substrate.

6. A method according to claim 5, wherein the first transparent encapsulation layer is a nitride-oxide-nitride layer (NON-layer).

7. A method according to claim 5 or 6, wherein this first transparent encapsulation layer is applied with the aid of a deposition technique, such as, for instance, a PVD-, CVD- or PECVD-process.

8. A method according to any one of claims 5 – 7, wherein after the application of the first transparent encapsulation layer, a first conductive layer is applied such that a number of parallel conductors extending in a first direction is provided which are mutually insulated from each other, while parts of the first conductors extend in pixel pits or sub-pixel pits of the surface structure of the substrate.

9. A method according to claim 8, wherein the layer application process for the first conductive layer is a sputtering process.

10. A method according to claim 9, wherein the shadowing structure comprises a number of parallel, narrow and deep grooves, the width and the depth of the grooves being such that at least a part of the side walls and/or the bottom of these grooves are hardly covered, if at all, with the first conductive layer in the sputtering process.

11. A method according to claim 8, wherein the first conductive layer is applied with the aid of a printing operation, such as for instance inkjet printing, silkscreen printing, electrostatic printing or thermal transfer printing.

12. A method according to any one of claims 8 – 11, wherein after the application of the first conductive layer, at least in the pixel pits or sub-pixel pits, a hole injecting layer such as for instance a PDOT-layer is applied.

13. A method according to claim 11, wherein the first conductive layer also forms a hole injecting layer in the pixel pits or sub-pixel pits, such as for instance a PDOT-layer.

14. A method according to any one of claims 12 or 13, wherein after application of the hole injecting layer a light emitting light is provided locally in at least the pixel pits or sub-pixel pits, such as for instance a PPV-layer.

15. A method according to at least claim 8, wherein at least those parts of the first conductive layer which are not covered with a light emitting layer and which, in a following process step, will be covered by a second conductive layer, are provided with an insulating covering prior to said following process step.

16. A method according to claim 15, wherein the insulating covering is applied with a printing operation, such as, for instance, by means of inkjet printing.

17. A method according to claim 16, wherein the insulating layer is formed from a UV-curing varnish.

18. A method according to claims 10 and 16 or claims 10 and 17, wherein the deep grooves forming the shadowing structure are filled up with the insulating covering.

19. A method according to any one of the preceding claims, wherein the shape of the surface structure, after application of at least one layer, is adapted by a transforming technique, such as, for instance, a local thermal treatment.

20. A method according to claim 19, wherein the local thermal treatment is carried out with the aid of a laser operation or with the aid of a local infrared irradiation.

21. A method according to any one of the preceding claims, wherein an additional relief structure is provided on the substrate already provided with a number of layers, for forming a relief structure desired for the application of a following layer.

22. A method according to claim 21, wherein the additional relief structure is provided with the aid of a printing operation, while using a curing varnish, preferably a UV-curing varnish.

23. A method according to claims 8 and 21 or claims 8 and 22, wherein after application of the insulator, a relief structure is provided for forming

channels extending parallel to each other, while the channel direction is perpendicular to said first direction in which the first conductors extend.

24. A method according to claim 15, wherein after application of the insulating covering, a second conductive layer is provided such that in simple manner, a number of parallel conductors are provided extending in a second direction and which are mutually insulated from each other, while parts of the second conductors extend in pixel pits or sub-pixel pits of the surface structure of the substrate.

25. A method according to claim 24, wherein the second direction is perpendicular to the first direction.

26. A method according to claim 24 or 25, wherein the second conductive layer is applied with a printing process, such as, for instance, inkjet printing, silkscreen printing, electrostatic printing or thermal transfer printing.

27. A method according to claim 23 and any one of claims 24 – 26, wherein the second conductive layer is applied in said channels extending parallel to each other.

28. A method according to any one of claims 24 – 27, wherein, prior to the application of the second conductive layer and after the application of the insulating covering, an electron injecting layer such as a calcium, magnesium, lithium fluoride or barium layer is applied to the substrate.

29. A method according to claim 28, wherein the barium layer is applied with a PVD-process.

30. A method according to any one of claims 24 – 27, wherein after the application of the second conductive layer at least one encapsulation layer is applied.

31. A substrate suitable and intended for use in a method according to any one of the preceding claims for manufacturing an organic electroluminescent display device, the method comprising the step of applying a first conductive layer by means of a layer application process, wherein the substrate has been manufactured from plastic and has a surface structure

forming a boundary for at least a number of the layers to be applied, the surface structure of plastic substrate being provided with a shadowing structure which is such that with the layer application process, parts of this shadowing structure are hardly covered, if at all, with the respective conductive layer, the shadowing structure being such that the electrical resistance prevailing there is great relative to the resistance in the rest of the conductive layer.

32. A substrate according to claim 31, wherein the surface structure comprises a number of pixel pits or sub-pixel pits.

33. A substrate according to claim 31 or 32, wherein the surface structure comprises a shadowing structure which is such that with a sputtering process, parts of this shadowing structure are not covered with the respective conductive layer.

34. A substrate according to claim 33, wherein the shadowing structure comprises a number of parallel, narrow and deep grooves, wherein the width and the depth of the grooves is such that at least a part of the side walls and/or the bottom of these grooves are not covered with the first conductive layer in the sputtering process.

35. A substrate according to any one of claims 31 – 34, wherein the surface structure is releasing such that it can be taken from a mold which is provided with a negative image of the surface structure.

36. A substrate according to any one of claims 31 – 35, wherein the substrate is an injection molding product.

37. A substrate according to any one of claims 31 – 36, wherein, in the pixel pits or sub-pixel pits, a structure has been provided which influences the generated light passing the structure.

38. A substrate according to any one of claims 31 – 36, wherein at the side of the substrate remote from the pixel pits or sub-pixel pits, a structure has been provided which influences the generated light passing the structure.

39. A substrate according to claim 37 or 38, wherein the structure comprises a Fresnel lens.

40. A substrate according to any one of claims 37 – 39, wherein the structure has a converging effect on the light issuing through the structure.

41. A substrate according to any one of claims 37 – 39, wherein the structure has a diverging effect on the light issuing through the structure.

42. A substrate according to any one of claims 31 – 41, wherein in the pixel pits or sub-pixel pits a structure has been provided, designed for improving the distribution of liquid for forming the layers provided in the pixel pits or substantially- pixel pits.

43. A substrate according to any one of claims 31 – 42, wherein in the pixel pits or sub-pixel pits a contact surface enlarging structure has been provided.

44. A substrate according to any one of claims 42 or 43, wherein the structure comprises capillary grooves.

45. An organic electroluminescent display device manufactured while using a method according to any one of claims 1 – 30 starting from a substrate according to any one of claims 31 – 44.